WHAT IS CLAIMED IS:

1. A zinc oxide film formed on a substrate;

the zinc oxide film having a plurality of texture constituents comprised of a plurality of hills each having structure wherein a first surface borders on a second surface along one curved line, where;

texture constituents in which first surfaces the hills of the texture constituents have have an average angle of inclination in a size within the range of from 30 degrees or more to 60 degrees or less and second surfaces have an average angle of inclination in a size within the range of from 10 degrees or more to 35 degrees or less account for at least a half of the plurality of texture constituents.

2. The zinc oxide film according to claim 1, wherein the first surface is formed of a curved surface, and the second surface is formed of substantially a plane surface.

3. The zinc oxide film according to claim 2, wherein the second surface is a (002)-plane of zinc oxide.

4. The zinc oxide film according to claim 2, wherein hills the average angle of inclination of the first surfaces of which is larger than the average angle

of inclination of the second surfaces account for at least a half of the plurality of hills.

5. The zinc oxide film according to claim 2, wherein hills whose projected areas of the first surfaces on the substrate are smaller than their projected areas of the second surfaces account for at least a half of the plurality of texture.

6. The zinc oxide film according to claim 2, wherein, when the texture constituents comprised of the hills are projected on the substrate, texture constituents having lengths of from 800 nm or more to 10 μm or less in their shape on a projection chart account for at least 80% of the whole texture constituents.

7. The zinc oxide film according to claim 2, wherein at least part of the zinc oxide film is formed by electrodeposition from an aqueous solution, utilizing electrochemical reaction.

8. The zinc oxide film according to claim 2, wherein the zinc oxide film comprises a multi-layer structure having a first zinc oxide film formed by sputtering and a second zinc oxide film formed on the first zinc oxide film by electrodeposition from an aqueous solution, utilizing electrochemical reaction.

9. A photovoltaic device formed by superposing a semiconductor layer on the zinc oxide film according to claim 2.

10. A photovoltaic device comprising a zinc oxide film and a semiconductor layer having at least one set of a p-i-n junction, wherein;

where, in respect of the light absorbed in a p-i-n junction closest to the zinc oxide film, the wavelength of light having the highest light collection efficiency is represented by X, the surface profile of the zinc oxide film on the light-incident side thereof satisfies the relations of $A \geq 15°$ and $1 \geq A/B \geq 0.5$ where the average angle of inclination that is found when the sampling length is set to be X is represented by A and the average angle of inclination that is found when the sampling length is set to be X/10 is represented by B.

11. A photovoltaic device according to claim 10, wherein the value A is $A \leq 40°$.

12. A photovoltaic device according to claim 11, wherein the A and B satisfy the relation of $0.9 \geq A/B \geq 0.6$.

13. A photovoltaic device comprising a zinc oxide film and a semiconductor layer having at least one set

of a p-i-n junction, wherein;

the zinc oxide film having a plurality of hills on the light-incident side thereof, and hills which have a size of from 1,000 nm or more to 2,500 nm or less as average diameter found from the number of the hills per preset area and in which the ratio c of the value a of length of each hill to the value b of breadth of each hill, a/b, is within the range of $1.5 \leq c \leq 7$ account for at least a half of the plurality of hills.

14. A photovoltaic device comprising a zinc oxide film and a semiconductor layer having at least one set of a p-i-n junction, wherein;

the zinc oxide film has a plurality of hills on the light-incident side thereof, and the hills have angles of inclination that have two maximums in their frequency distribution.

15. The photovoltaic device according to claim 14, wherein the semiconductor layer having a p-i-n junction, formed on the zinc oxide film, has a plurality of hills on the light-incident side thereof, and the hills have angles of inclination that have one maximum in their frequency distribution.

16. The photovoltaic device according to claim 14, wherein at least part of the zinc oxide film is formed

by electrodeposition from an aqueous solution, utilizing electrochemical reaction.

17. The photovoltaic device according to claim 14, wherein the zinc oxide film comprises a multi-layer structure having a first zinc oxide film formed by sputtering and a second zinc oxide film formed on the first zinc oxide film by electrodeposition from an aqueous solution, utilizing electrochemical reaction.

18. A zinc oxide film formation process which forms a zinc oxide film on a conductive substrate by immersing the conductive substrate and an opposing electrode in an aqueous solution containing at least nitrate ions, zinc ions and a polyhydric carboxylic acid, or an ester thereof, in which carboxyl groups are bonded to a plurality of carbon atoms each having an sp^2 hybrid orbital, followed by electrification across the conductive substrate and the opposing electrode;

the process comprising the steps of forming a zinc oxide film at a first current density and forming a zinc oxide film at a second current density.

19. The zinc oxide film formation process according to claim 18, wherein the second current density is higher than the first current density.

20. The zinc oxide film formation process according to claim 18, wherein the zinc oxide film formed at the second current density has a thickness larger than the thickness of the zinc oxide film formed at the first current density.

21. The zinc oxide film formation process according to claim 18, wherein zinc ion concentration A and nitrate ion concentration B in the aqueous solution has a relation of $2A \leq B$.